Name_____

Algebra 2
Lesson 5-5
Quadratic Equations

FACTORING

The solution to a quadratic equation is the value of **x** when you set the equation equal to zero. In other words: T= $ax^2 + bx + c$; solve for **x**. In the last section, we learned how to factor a quadratic expression. This skill will enable us to find solutions to x algebraically when we use the **Zero-Product Property.**

- **Zero-Product Property:** If ab=0, then a=0 or b=0 (If a product of 2 values equals zero, it stands to reason that one or the other term will have to be equal to zero)
  Example: $(x+4)(x+8) = 0, then\ (x+4) = 0\ or\ (x+8) = 0$
  from here we can solve these 2 little equations for x: subtracting 4 and 8 respectively from both sides of the equation we find that $x = -4\ or\ -8$.

Let's put the whole picture together:

Example: Solve for x by Factoring:

$24x^2 + 7x - 6 = 0$

$24x^2 - 9x + 16x - 6 = 0$

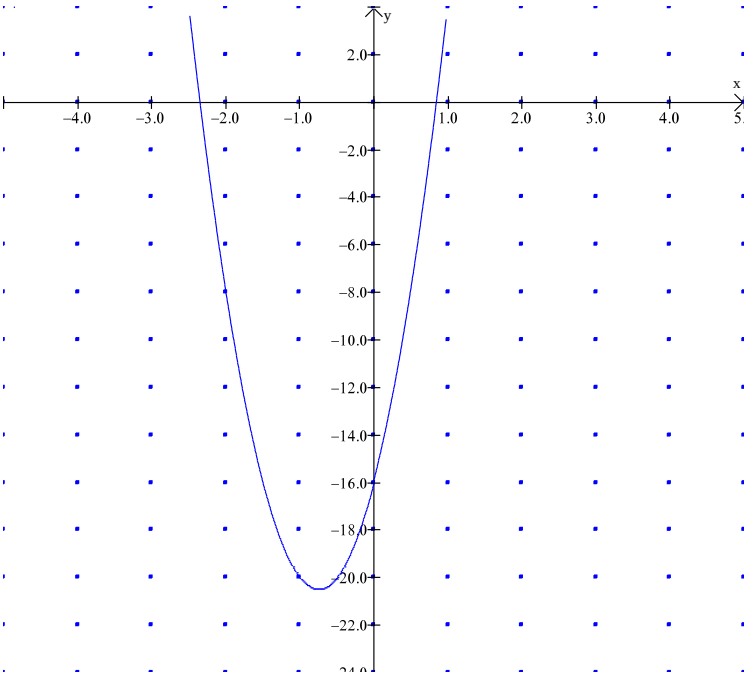
$3x(8x-3) + 2(8x-3) = 0$
$(3x+2)(8x-3) = 0$
$3x+2 = 0\ or\ 8x-3 = 0$
$x = -\frac{2}{3}\ or\ x = \frac{3}{8}$

1. ac=-144 factor pairs: $1 \cdot 144,\ 2 \cdot 72,\ 3 \cdot 48, 36 \cdot 4,\ 24 \cdot 6,\ 8 \cdot 18,\ \mathbf{9 \cdot 16}$
2. rewrite the quadratic; with 7x positive, linear terms will be 16x and -9x
3. separate terms and factor out a 3x
4. factor one last time
5. using the Zero-Product Property solve for x

TABLES AND GRAPHING

Not every quadratic is factorable. We saw this in a review worksheet: $8x^2 + 12x - 16 = 4(2x^2 + 3x - 4)$
In these cases we can graph the quadratic equation and find the solutions to the equation off the graph.

Example: Graph $8x^2 + 12x - 16 = 0$



What do you see?
That is, where does the parabola cross the x-axis?
ANS.: At the x-intercepts! These are the points where y is equal to 0 and are called **zeros of the function** or **the roots of the equation**.

In other words, if we graph the parabola on the calculator then, **2nd TRACE, 2: zero, ENTER**, and follow the directions to identify the left and right bounds WRT the parabola intersecting the x-axis, you will get the zeros for the equation. Note: you will need to do this process twice so to find both **zeros of the function.**

$\boldsymbol{x = -2.35\ or\ 0.85}$

We can also find the solutions to the equation by a second calculator method which uses the table:

1. With the quadratic equation entered into the **Y=** press **2nd Window** (table set)
2. Verify that the table is set for auto for both independent and dependent variables. The ΔTbl allows you to set the increment for the x variable.
3. Press **2nd GRAPH** and the table with x and y values will show up.
4. To view both graph and table press **MODE** arrow down and right to **G-T** (graph-table) **ENTER, GRAPH,** you will see a split screen showing both the table and graph.
5. To toggle between the graph and table press **GRAPH** for graph control and **TRACE or 2nd GRAPH** for table control.

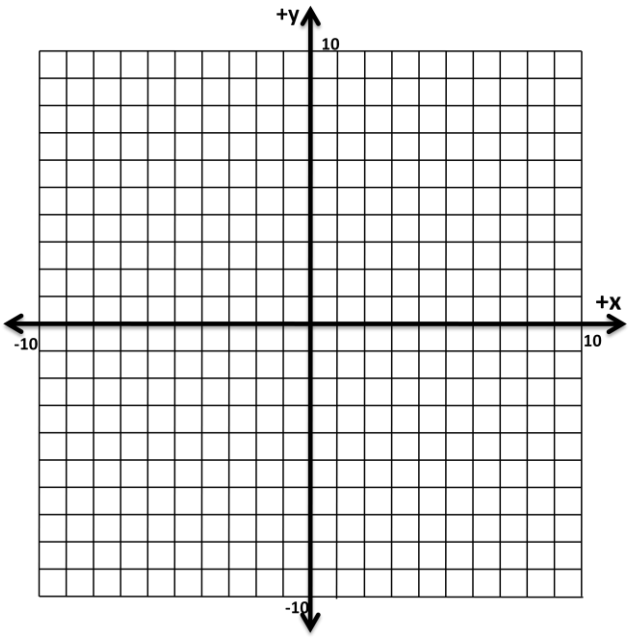
For this example, using the graph and finding the zeros is clearly more efficient, as the table doesn't give the zero, but the two x-values that the zero is between.

1. Solve by factoring:
$2x^2 + 4x = 6$

2. Solve by factoring:
$16x^2 = 8x$

3. Solve by factoring:
$4x^2 - 25 = 0$

4. Solve: $x^2 + \frac{1}{2}x - \frac{1}{4} = 0$



5. Write the equation of the parabola shown in the graph <u>in vertex form</u>